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Abstract:	This short communication describes the clinical and morphological findings, diagnosis, and treatment of a case of *Mycobacterium avium* infection in a golden retriever that presented with a progressive nasal swelling and lymphadenopathy. Although well documented in cats, where cutaneous lesions are frequently recognised, canine *M. avium* infection is less commonly reported, and cutaneous lesions are rare. To the authors' knowledge this is the first documented case of canine *M. avium* infection that presented with a cutaneous lesion but no systemic clinical signs. It occurred in a dog with no previously reported breed predisposition and highlights that in cases of cutaneous histiocytic infiltrate in dogs *M. avium* should remain a differential diagnosis, even in the absence of suggestive organisms on histopathological examination.

Unusual presentation of canine *Mycobacterium avium* infection

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ABSTRACT

This short communication describes the clinical and morphological findings, diagnosis, and treatment of a case of *Mycobacterium avium* infection in a golden retriever that presented with a progressive nasal swelling and lymphadenopathy. Although well documented in cats, where cutaneous lesions are frequently recognised, canine *M. avium* infection is less commonly reported, and cutaneous lesions are rare.

To the authors' knowledge this is the first documented case of canine *M. avium* infection that presented with a cutaneous lesion but no systemic clinical signs. It occurred in a dog with no previously reported breed predisposition and highlights that in cases of cutaneous histiocytic infiltrate in dogs *M. avium* should remain a differential diagnosis, even in the absence of suggestive organisms on histopathological examination.

Mycobacterial infections are a significant cause of morbidity and mortality in humans and farm animals, and are of increasing clinical significance in companion animal medicine[1-4]. Disease-causing species are grouped into those that cause tuberculous disease (*i.e.* members of the *Mycobacterium tuberculosis* complex) and those that cause a non-tuberculous mycobacteriosis (NTM)[5].

In humans, the prevalence of NTM is increasing, with *Mycobacterium avium-intracellulare* complex (MAC) organisms being isolated in a significant proportion of cases[6,7]. Similarly, MAC was identified as the most common cause of feline NTM in the UK[8]. In contrast, incidence data for canine NTM does not exist. Reports of canine MAC infection are rare and miniature schnauzers and basset hounds are overrepresented. It is suggested that these breeds have a genetic predisposition to infection[9-13].

In cats, skin lesions are a frequent feature of the disease[8]. In dogs, cutaneous lesions are reported in only 2 cases[13,14]. Most cases demonstrate involvement of the gastrointestinal tract, liver, and spleen. Systemic clinical signs include lethargy, weight loss and diarrhoea [9-28].

This short communication describes an atypical case of canine *M. avium* infection that occurred in a breed with no reported predisposition, and presented with a cutaneous lesion but no systemic clinical signs.

A three-year-old, male neutered, golden retriever presented for investigation of progressive nasal swelling of six weeks' duration. The dog was on schedule with core vaccines recommended by the World Small Animal Veterinary Association (WSAVA) for UK resident dogs, was fed a complete cooked diet, received regular preventive treatments for endoparasites and ectoparasites, and there was no history of travel outside the UK.

Physical examination detected a firm, non-painful swelling affecting the nasal dorsum (Fig. 1a) and enlargement of the left pre-scapular and right popliteal lymph nodes.

Routine haematology and serum biochemistry were unremarkable, partial thromboplastin time and activated partial thromboplastin time were within reference interval, and *Aspergillus* species serology was negative.

Head CT demonstrated a soft-tissue attenuating mass affecting the dorsal aspect of the nose, and moderate enlargement of the mandibular and medial retropharyngeal lymph nodes (Fig. 2a & 2c). Abdominal CT demonstrated subcutaneous nodules of the abdominal wall. Medial iliac lymph nodes were not reported to be enlarged on CT but were enlarged on abdominal ultrasonography. Thoracic CT and rhinoscopy were unremarkable.

Fine needle aspirates (FNAs) of the nasal mass were non-diagnostic. Ultrasound-guided FNAs of the affected lymph nodes were consistent with lymphoid hyperplasia. Histopathology of punch biopsies from the nasal mass revealed a histiocytic infiltrate. No fungal organisms or bacterial colonies were observed and special staining for infectious agents, including bacteria (Gram), acid-fast bacteria (AFB) (Ziehl-Neelsen (ZN) and fungal elements (Periodic acid–Schiff (PAS) was negative. Aerobic, anaerobic and fungal cultures were negative. To investigate further, the right mandibular lymph node was excised and a wedge biopsy taken from the nasal mass. Histopathology revealed histiocytic and neutrophilic lymphadenitis; and histiocytic, lymphocytic, and neutrophilic dermatitis

and cellulitis (Fig. 1b). As above, no microorganisms were observed and special staining for infectious agents was negative.

A sample of the nasal mass was submitted for culture for *Bartonella henselae* and *Bartonella B spp*., which was negative, and for PCR analysis for *Mycobacterium* species (TDDS, Exeter, UK). The resultant PCR product was purified and sequenced, and a Basic Local Alignment Search Tool (BLAST) was used to compare the DNA to sequences reported in the genetic sequences database Genbank. This identified the PCR product as a *Mycobacterium* species, most closely related to *M.avium*, with 98% similarity.

Treatment was initiated with enrofloxacin (Baytril, Bayer; 10mg/kg orally every 24 hours) and doxycycline (Ronaxan, Merial Animal Health; 10mg/kg orally every 24 hours), with limited response. Following further research, the protocol was adjusted to enrofloxacin (as above), clarithromycin (generic; 15mg/kg orally every 12 hours), and rifampicin (generic; 10mg/kg orally every 24 hours). After four months the nasal lesion had significantly reduced in size. On palpation the left pre-scapular and right popliteal lymph nodes were normal. CT performed after nine months confirmed the improvement in the nasal lesion and demonstrated resolution of the mandibular and retropharyngeal lymphadenopathy and sub-cutaneous nodules (Fig. 2b & 2d). Treatment was discontinued.

M. avium is an opportunistic human and animal pathogen, and is ubiquitous in the environment. Reservoirs include water-bodies, soil, hot water systems, livestock and wildlife[29-31]. Infection occurs following ingestion or inhalation of organisms, or through breaches of the skin[32]. A hunting or fighting lifestyle is hypothesised to increase the risk of NTM in cats, and it has been suggested that working dogs are at increased risk, although this was not a factor in this case[33,34].

Despite its zoonotic potential there are currently no reports of transmission of *M. avium* from companion animals to humans. Risk of transmission is mainly thought to be significant to immunocompromised individuals[35,36].

This case of canine *M.avium* infection has several interesting features. Presence of high numbers of AFB is considered an almost pathognomonic feature of most previously reported NTM cases[13,15,20,21,37]. Here *M. avium* was detected by PCR in the absence of AFB on histopathological examination. It is possible that the PCR product was a contaminant, but the clinical improvement following combination antibiotic therapy provides support for a true MAC infection.

The case is also remarkable in its presentation. Although unconfirmed, the presence of the abdominal nodules and generalised lymphadenopathy, and their improvement following treatment, suggests disseminated disease. Most disseminated canine MAC cases present with a history of systemic clinical signs but in this case the nasal mass was the only presenting complaint[12,13].

To the authors' knowledge this is the first documented case of canine *M. avium* infection that has presented with a skin lesion but no systemic clinical signs. The disease occurred in an atypical breed and there was no evidence of AFB on histopathology. Given the zoonotic potential of the disease, misdiagnosis could have consequences for public health, as well as for the individual patient. As such NTM should be considered as a differential diagnosis in cases of cutaneous histiocytic infiltrate in

dogs, even in the absence of breed predisposition, systemic clinical signs and suggestive organisms on histopathological examination.

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COMPETING INTERESTS

All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare: Conor O'Halloran is in receipt of a grant from Biotechnology and Biological Sciences Research Council; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work.

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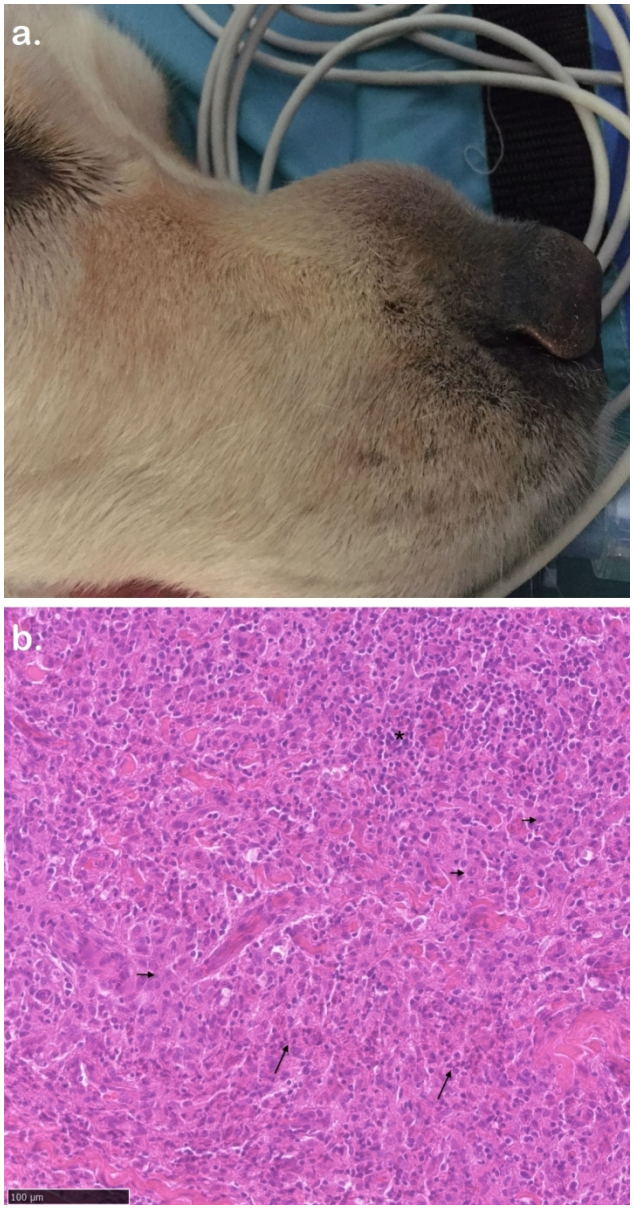
LEGENDS

Fig. 1: a) Nasal lesion b) Histological section of the nasal mass. The subcutaneous infiltrate was composed predominantly of macrophages (short arrows) with scattered neutrophils (long arrows) and small aggregates of lymphocytes (*). Magnification x 200. H&E.

Fig. 2: Head CT demonstrating a) an ill-defined, irregularly shaped, soft tissue attenuating space-occupying lesion at the dorsal aspect of the nose pre-treatment (arrows) b) much smaller nasal lesion post-treatment (arrows) c) moderately enlarged mandibular lymph nodes pre-treatment (arrows) d) mandibular lymph nodes within normal limits post-treatment (arrowheads)



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304x581mm (96 x 96 DPI)

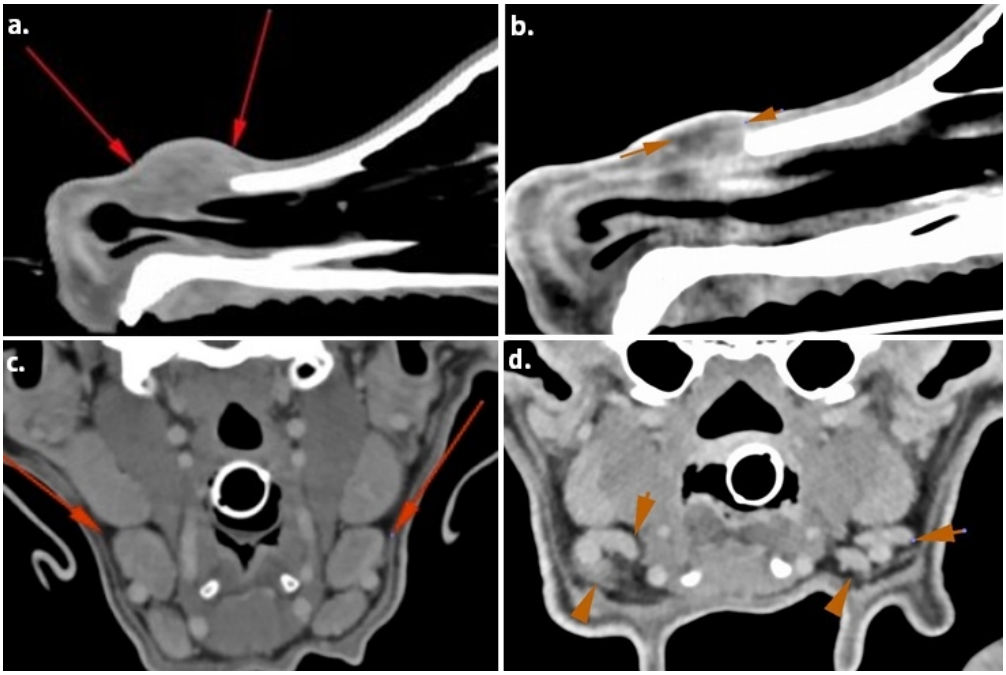

Fig. 2: Head CT demonstrating a) an ill-defined, irregularly shaped, soft tissue attenuating space-occupying lesion at the dorsal aspect of the nose pre-treatment (arrows) b) much smaller nasal lesion post-treatment (arrows) c) moderately enlarged medial retropharyngeal lymph nodes pre-treatment (arrows) d) medial retropharyngeal lymph nodes within normal limits post-treatment (arrowheads)

194x129mm (96 x 96 DPI)